The Imperial Forestry Institute University of Oxford

TWENTY-SEVENTH ANNUAL REPORT

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TWENTY-SEVENTH ANNUAL REPORT OF THE IMPERIAL FORESTRY INSTITUTE ACADEMIC YEAR, 1950-51

Students. The total number of students at the Institute was 47, 25 undergraduates and 22 graduates; this total is twelve less than last year, and the number of undergraduates is below what is considered desirable. Thirteen candidates sat for the Final Honour School, two obtaining First Class, four Second Class, five Third Class, and two Fourth Class Honours. Two of these new graduates were already members of the Colonial Forest Service, and another has since been appointed to that Service. One candidate came from New Zealand and one from Ceylon, and both have now returned to their own countries to take up appointments in their own Forest Services.

The junior year started with eleven students, but two dropped out during the year in favour of other subjects. The low number seems to be ascribable to a variety of causes, but mainly to doubts as to prospects of subsequent congenial employment; an immediate rise is not to be expected.

The Colonial Forest Officers' course was attended by thirteen Officers coming from Nigeria (6), Gold Coast (2), Tanganyika Territory (2), Northern Rhodesia (1), Kenya (1), and Uganda (1). One officer had unfortunately to retire from the course owing to illness.

Continuing the practice of the two previous years, two Nigerian Forest Assistants and one European Forester from Kenya attended. All three worked well and successfully completed programmes of work drawn up for them.

Only one Indian Officer was deputed this year for the special course arranged for Indian and Pakistan Officers; no one was deputed from Pakistan. This was ascribed to financial stringency as both Governments wish to continue the existing arrangements.

A German student from the Forestry School of the University of Göttingen (Münden) attended for one term and another student from the same University visited the Department for a fortnight.

Research Students. Only one student took the Diploma in Forestry — a Russell Grimwade Scholar, D. W. R. Stewart, of the Forest Department of Western Australia. Two students are studying for B.Sc. — one, an Oxford forestry graduate, on 'Some aspects of the interaction between grass growth and tree seedlings' and the other, a student from the University of British Columbia, on the 'Autecology of certain British Columbian trees.'

Prizes. The Coopers Hill War Memorial Prizes were awarded to M. S. Philip, now in the Colonial Forest Service, Uganda, and B. E. St. L. Stuart, now in the Colonial Civil Service, Malaya. The Schlich Prize for the best all-round Officer attending the post-graduate course was awarded to D. G. Cumming, Northern Rhodesia.

Instructional Tours. (1) The introductory tour in Britain for students about to start their forestry course and for those overseas students who are not familiar with British forests and forestry, was made just before the beginning of the Michaelmas Term. It was started off by the Professor and continued by Colonel Lloyd and Dr. Anderson with the help of local foresters. The private estate visited this year was Powis Castle, by the kind permission of the Earl of Powis.

(2) The junior class paid the usual visit to the forests of Normandy and the Landes, conducted by Dr. Jones; the party numbered twelve with the inclusion of four senior students.

(3) The senior group of seventeen students made a tour of Holland with the Professor and Dr. E. W. Jones. Facilities for the tour were given by the Head of the State Forest Service of the Netherlands, Mr. F. W. Malsh, and he kindly deputed one of his staff, Mr. W. L. Jansen, to conduct the party.

(4) The Colonial Forest Officers made a short tour with Dr. Anderson in the South of England to see representative forests and operations. In June-July they visited the Vosges and Jura forests with Colonel Lloyd and Mr. Brasnett, finishing with a few days' stay in the adjoining parts of Switzerland. Two days during this tour were spent in joint excursions with the French Forestry students from Nancy; this liaison, arranged with the Director, M. Oudin, proved particularly profitable as more than half the French party consisted of candidates for the French Colonial Forest Service.

Working Plans. As mentioned last year, the junior year did their Part I work in September, 1950. Part II was completed during Easter vacation, 1951. Three Colonial Forestry probationers who had done their Part I in High Meadow Woods returned there for Part II.

Utilisation Course. The course for Senior students at the Forest Products Research Laboratory was, as in previous years, arranged for the Christmas vacation. Special thanks are due to the Director and to Mr. C. W. Scott for the arrangements made, and to those of the staff who gave demonstrations, etc.

Vacation Practical Work. The now established practice was continued of ensuring that students get practical experience by working in woods and saw-mills. Nine students were provided with practical work by the Forestry Commission during the long vacation, in the New Forest, Thetford and Cheviots Divisions, and thanks are due to the Conservators concerned for the arrangements made. Five other students were found remunerative work on private woodland estates. Two timber firms in Norway also kindly employed another five students for three weeks.

Excursions. Excursions were made with the senior and post-graduate students during the summer term to the Duke of Buccleuch's estate at Boughton, Northamptonshire; the Forestry Commission Research Station at Alice Holt; Commission forests at Bramshill; Rothamsted Experimental Station; Messrs. Glikstens' sawmills and Messrs. Mallinson and Sons' sawmills and veneering plant, London; furniture factories and a composite wood factory at High Wycombe; and Messrs. Hunting Aerosurveys Ltd., at Elstree.

The junior year visited local woods mainly to study soils and silviculture with Dr. Jones and Dr. Anderson: Wytham Wood was very convenient for these purposes. They also accompanied the senior year students on their excursion to Bramshill.

Thanks are tendered to all those who kindly gave facilities for these useful visits and to those who showed our parties over woods and works.

Discussions. Fourteen open discussions of forestry topics of general interest were organised for the Colonial Forest Service Officers under the leadership of each of them in turn. The best was probably that on the 'Use of exotics in the tropics.' Short papers were read on selected topics during Trinity Term, each member taking his turn, followed by questions and then general discussions. The latter procedure was also adopted for the senior undergraduate year, the papers being usually on the special subject each was studying.

Seminars in Tropical Silviculture. A series of seminars was started in Trinity Term for the Forest Officers to determine whether this would be a better method for the subject than a course of lectures. The seminars were considered to be preferable and will be continued.

Visiting Lecturers. As usual, a series of lectures was arranged, primarily for the post-graduate course, which dealt with special aspects of forestry problems not expressly covered by the staff of the Institute. Specialists in the selected subjects were invited to give a lecture and deal with questions arising from it. Among the subjects dealt with this year were: modern weather forecasting, tropical hardwoods as a potential source of fibre for paper and board manufacture, swollen root disease of cacao, termites, wild life conservation, tsetse control, genetics, soil conservation techniques, mycorrhiza and the rôle it plays in forestry, forest administration in the Colonies, weed control, problems of land use survey in the tropics, birds and mammals in relation to forestry. The first six of these subjects appeared on the list for the first time. The Institute is much indebted to the specialists who kindly agreed, often at considerable inconvenience to themselves, to come to the Institute to give these lectures and deal with questions afterwards.

Assistance from other Departments. The Department of Surveying and the Soil Science Laboratory have continued their special courses for forestry students, and the Institute is also much indebted to the readers and their staff for help with the work of individual students. The Institute is also much indebted to the Lecturers in Colonial Agriculture and in the Design and Analysis of Scientific

Experiment for courses of lectures given to the senior year and post-graduate students.

Assistance given to other organisations. Dr. Chrystal continued to visit the Foresters' Schools of the Forestry Commission to give short courses on Forest Entomology. He visited five schools in England, Scotland and Wales for this purpose during the year. The Professor gave a course of lectures on Colonial Forestry to the Colonial Administrative Service Cadets at Cambridge University as in other years.

Tuition. Stress continues to be placed on individual tuition, individual members of the staff supervising the work of students from groups of two or three colleges, as well as that of all students for the appropriate branch of forestry.

Library, etc. The transfer to the new building was effected during the long vacation and the Commonwealth Forestry Bureau moved from its temporary quarters in the New Bodleian Library into the rooms adjoining the Library, though the available space is barely adequate. A fuller account is given later in this Report.

Staff tours. During the year, Mr. G. H. Thompson paid a visit to the State Entomological Research Station in Stockholm, Sweden, at the invitation of Professor V. Butovitsch. From there he made several tours of forest insect field stations and field projects in Central and South Sweden. In May, 1951, he visited Canada to undertake a four months' tour of the principal centres of forest entomological research throughout the Dominion.

Colonel Lloyd paid a three months' visit to Africa during the year under special arrangements made by the Colonial Office with the Colonies concerned. The main object of the tour was to study local methods of timber felling, extraction and conversion in Africa as a basis for the lecture courses in Forest Engineering and Utilisation given to Colonial Forest Officers and Probationers at this Institute. Further particulars are given later in this Report.

In the course of a visit to Western Norway, Dr. Leyton was able to see field experiments on the establishment of trees on heathland.

Research Field Station. The Yorkshire Station has been transferred a few miles from Birchall to Wykeham and was used frequently by members of the Research Staff, particularly by Mr. Rennie and Dr. Dimbleby. Acknowledgment is made of the help so freely and willingly given by Mr. Weatherell, the Research Forester stationed in the area.

Scientific Societies, etc. At the British Association meeting at Edinburgh, Dr. Chrystal read a paper on 'The role of insects in Forestry' at a joint meeting of the Zoology, Botany and Forestry Sections. The Professor also attended the meetings. Mr. Murphy read a paper on his work on soil fauna to the Congress of British Entomologists in London.

Members of the staff have been active on the councils and committees of numerous societies as in former years, particularly the forestry societies.

Government Committees. The Professor continues to serve on the Forestry Commission's Research Advisory Committee, and on the Colonial Office Committee for Colonial Agricultural, Animal Health and Forestry Research. Colonel A. H. Lloyd is on the Eastern Advisory Committee (Forestry Commission) and the Forest Products Research Board (Department of Scientific and Industrial Research). Mr. MacGregor served on the Working Party on Forestry and Agriculture of a Government Technical Committee on National Resources; he also continued to serve on the Oxon and Bucks Divisional Committee of the Royal Forestry Society of England and Wales, and is a member of the Executive Committee of the Agricultural Economics Society.

Exhibitions. Although no exhibitions were staged this year apart from the one prepared for the opening of the new building this was by far the most comprehensive undertaken so far; several of the exhibits are being maintained for further use, particularly the sectional exhibits illustrating current research.

The New Building. The outstanding event of the year was the completion and formal opening of the new Institute building in South Parks Road, about 150 yards east from the old School of Forestry. The opening ceremony was performed by H.R.H. Princess Margaret on October 19th, 1950, in the presence of about 350 guests; an illustrated brochure describing the building was distributed on this occasion. The new Institute is a three storeyed stone building with semi-basement for workshops, etc.; it is linked through a shared lecture theatre with the new Botanical Department which has been completed since the end of the year under report. The staff and activities now accommodated in the one building were previously scattered among four houses in four different streets so that administration has been greatly facilitated and at the same time far better conditions for both teaching and research have been provided. There are three lecture rooms seating 110, 40 and 25 respectively, three teaching laboratories, three secretarial rooms, a staff meeting room and a students' common room, as well as appropriate rooms and laboratories — about 50 in all — for the staff and work of the fourteen sections. The front half of the first floor is occupied by the Library and the rooms allocated to the Commonwealth Forestry Bureau. Twelve rooms are panelled with timber generously presented by the various countries of the Commonwealth, and timber for floors and furniture was received from the same sources. In all, ten kinds of timber have been used for panelling, fourteen for general furnishing, fourteen for flooring, twenty-three for doors and twenty-nine for furniture, out of contributions received from twenty-eight Commonwealth governments and six timber firms. The building and its equipment thus provides an outstanding exhibition of timbers in functional use, most appropriate to a Commonwealth centre for higher education and research.

An exhibition to illustrate the part played by forests in human welfare and the current activities of the various sections was staged

for the opening; this was seen by nearly 1,000 visitors: many requests were received later from interested societies, etc., to see over the building: other organisations have also requested the use of the lecture theatres for meetings.

The new Institute building is complete, but various ancillary structures, notably the glasshouses and cycle shed, have still to be erected. It has already been found that storage space is very inadequate, and possible methods of meeting this defect are being considered.

Dr. Chalk continued to deal with all matters concerning the gift timbers and Dr. Handley those relating to the laboratory and other fittings respectively.

Senior Staff. During the year under report, it became necessary to consider two impending retirements. Dr. Chrystal intimated his intention of retiring in September, 1951; Mr. G. H. Thompson already appointed as Assistant, succeeds him. Dr. M. L. Anderson, who joined the staff in 1946, gave in his resignation in order to take up an overseas appointment. (He left the Institute in September, 1951, having subsequently been offered the Chair in Forestry at Edinburgh University, and Mr. T. E. Edwardson, formerly of the Colonial Forest Service and the U.K. Forestry Commission, has taken his place). Mr. Murphy completed the term of his four-year appointment for the study of soil fauna and left the Institute at the end of June, but he will be continuing his work at Rothamsted. Mr. Rennie's appointment was again extended with a further grant from the Forestry Commission.

Technical Staff. The increasing pressure on the workshop for maintenance and building of new apparatus has necessitated the appointment of a second metal worker, mainly on precision work. There have been some minor changes in the other sections. There are now eleven technical assistants for the eight laboratories, apart from the workshop staff of three and the Photographic and Artist's Sections also with three. Willing and efficient assistance has been rendered by all during the year.

Secretarial Staff. There have been no important changes during the year, during which the staff have carried out a heavy programme of work.

WYTHAM WOODS

Under the plan of operations for the year, planting work moved from the wartime arable land into a partly wooded compartment where much heavy scrub had to be cleared. The very wet spring seriously delayed extraction of the felled timber and abundance of natural regeneration of ash reduced the area to be planted, and only three acres were planted up using approximately 2,000 oak and 2,200 ash. Earlier plantations were weeded as necessary and casualties replaced; their development is on the whole satisfactory, especially the ash. Young natural crops in the year's planting area were thinned

as also were groups of promising ash regeneration elsewhere. Remunerative prices were obtained for the sycamore coppice poles for turnery work. A hundred and seven over-mature spruce trees were felled and sold to a timber merchant, who hauled the logs 120 miles by road to a sawmill in Staffordshire.

A resident keeper has now been appointed to protect the woods and help in various matters of maintenance; this has relieved the forester of a difficult task and Sunday duties. Other University Departments have made increasing use of the woodlands for biological research.

'Dedication' is still pending with the Forestry Commission, apparently on minor details which it is expected to clear shortly. The staff have again worked very well.

BAGLEY WOOD

Dr. Anderson completed his Working Plan. It has been submitted to St. John's College for approval and, subject to any modifications they may wish to make, will go forward to the Forestry Commission for acceptance under the 'Dedication' scheme. It is on generally similar lines to that for Wytham Wood, aiming at bringing the whole area into maximum production by stocking all blanks and improving the quality of the growing stock: hardwoods are to be favoured, conifers being used only as nurse trees or relatively small groups: all stands will be thinned on a 5-year cycle.

KENNINGTON NURSERY

This continues to be used by the Forestry Commission for research work with a wide series of investigations in progress, notably on the maintenance of fertility by use of artificial manures, grass leys and green crops, poplar cultivation, vegetative propagation of difficult species, chemical weed control, etc. The nursery is most useful for instructional purposes and as in previous years, the Institute owes much to Mr. W. G. Gray for his continuous help and able demonstrations to students and professional visitors.

SILVICULTURE

In addition to normal teaching duties at the Institute, and on excursions and tours, Dr. E. W. Jones has continued work on the data collected in the rain forests of South Nigeria. A research student, S. D. Richardson, has been working on the mechanism of competition between grass growth and tree seedlings, a general problem to which attention is being devoted as opportunity offers. Dr. Jones has also undertaken the revision of R. S. Troup's *Silvicultural Systems*, which is out of print but much in demand.

The Professor gave a course of sixteen lectures on Tropical Silviculture and six candidates successfully offered this optional subject in the Final Honour School.

Lecture courses have been given by Dr. E. W. Jones and Dr. G. W. Dimbleby. Dr. Dimbleby prepared a thesis on some of the results of his research work of the previous four years on the special ecology of the Yorkshire heathland moors east of Scarborough, in relation to their history, to the natural regeneration of birch and pine, and to soil processes as influenced by the vegetation both natural and planted. He finds that the soil on these moors has deteriorated greatly in consequence of the clearing of the broad-leaved forest they carried formerly and its replacement by heath; and he adduces evidence that the degradation process will continue under pure conifer crops, but can be reduced and even reversed by a birch cover or broad-leaved admixture. These findings have been extended by preliminary enquiries made with a view to ascertaining how far they are applicable to other heathland areas. It seems that the heaths of the New Forest, and probably also those in Berkshire, the only ones so far examined, originally carried hardwood forest, but that this was destroyed by early man. It is apparent that in the New Forest there is good material from which to study the regeneration of brown soils from old podzols, a process which in this region is initiated not only by birch but also by holly, a widely distributed species in the New Forest. Under the grazing practised outside the enclosures, it seems likely that grass has at times replaced heath and itself contributed to the dissolution of the podzol profile.

The field experiments started last year in Yorkshire to find hardwoods suitable for use on the moors have been extended by further sowings this year, so that a total of some thirty species is now under test. The experiment on the effect of birch litter is being maintained, and an attempt is being made to establish a birch crop on the plots as quickly as possible.

During the course of these studies evidence has been obtained that, as a result of frost action during glacial times, the surface of the land in question became intersected by a polygonal structure of ice-wedges. In the course of time the ice was replaced by boulder clay which can be seen in vertical section, in wedge-shaped masses. This history is still reflected in the surface micro-relief and the vegetation.

Tree physiology. Dr. L. Leyton gave courses of lectures in physiology and soil biology and continued his research work in these fields.

Removal of *Calluna* in checked spruce plantations has resulted in a marked improvement in the appearance of the trees. The recovery of the spruce from a previous chlorotic condition is accompanied by a significant increase in nitrogen content of the needles and in their dry weights. On the cleared plots, the trees contain double the amount of nitrogen found on the plots with *Calluna*. Similar increases in nitrogen content have been brought about by mulching with dead *Calluna* and also by the addition of nitrogenous fertilizers. It is now evident that the availability of nitrogen is one of the most important

factors limiting tree growth on these heathland sites. The effect of the *Calluna* on the pines is much less marked but still significant as far as the nitrogen content and needle dry weights are concerned. There are also significant changes in the potassium, calcium and manganese content of the spruce needles. Although the spruce have responded to phosphatic fertilizer by increased absorption of phosphorus, as yet there has been no corresponding increase in tree growth such as has occurred with increasing nitrogen content.

Investigations into the nutrient status of *Calluna* growing in different communities have been extended (J. R. Aaron). Analyses of foliage made at different times of the year show that despite seasonal variations (particularly marked at flowering) significant differences between communities were still maintained. It has been shown that luxuriance in growth of *Calluna* is related to the nitrogen content of its foliage. The close relationship between the nitrogen nutrition of spruce and *Calluna,* when growing side by side, offers a possible explanation for the fact that the luxuriance of the latter can be used as a guide to soil fertility. With the kind co-operation of the Forest Research Station of Vestland, Norway, and the Norwegian Forest Research Institute, Vollebek, a tour was made of field experiments on the establishment of trees on *Calluna* sites in Western Norway.

An improved type of Flame Photometer for the analysis of K, Ca and Na in plant material has been designed and built. A full report of this has been prepared and is awaiting publication.

Microbiology. The investigation of the protein complexes formed in the dying leaves of certain plant species and thought to be responsible for the formation of raw humus, has been continued by Dr. W. R. C. Handley with attention to their microbiological breakdown under various conditions.

Although there is evidence that lignified tissue is decomposed by fungi in heathland and agricultural soils, the production of sporophores, by which the responsible wood and litter destroying fungi could be detected and identified, is of infrequent occurrence. In view of the absence of methods for detecting and isolating wood and litter destroying fungi in the vegetative phase from soils and decomposing litter, efforts are being made to devise selective inhibitory media which will allow of the detection and isolation of at least some members of this group of organisms.

During the course of work on the microbiological aspects of the problem of protein complex formation, it has been observed that some of the strains of wood and litter destroying fungi used have synthesized relatively large amounts of jelly-like material from soluble materials obtained from leaves and litter. It seems likely that such materials may be of importance in the formation of crumb structure in mull soils.

These investigations have now reached the stage when the assistance of a biochemist is desirable, and it is hoped that this will become available.

Dr. E. W. Russell and Mr. G. R. Clarke of the Soil Science Laboratory gave special undergraduate courses of lectures for forestry students as usual, and Dr. Russell also gave a course on tropical soils.

Physico-chemical Properties of Forest Soils. Mr. P. J. Rennie continued his studies on the Yorkshire moors. The success of new field apparatus described in earlier reports and the improved laboratory facilities at Oxford have made possible a great amount of work in the past year; all told, some 500 soil profiles have been dealt with.

Studies of particle size distribution in a range of soils from Allerston Forest have shown that an increase in the smaller sized particles is usually correlated with increased difficulty of afforestation in these soils. The coarse sand of the Passage Beds is easier to deal with than the fine sand of the Lower Calcareous Grit, which has also a higher clay and silt content. The success of cultivation techniques also appears to be related to the particle size composition. On Silpho Moor, deep, as compared to shallow, ploughing ensures greater survival and marked improvement of growth. Shallow ploughing results in high mortalities where the soil has a high clay content, whereas deep ploughing ensures satisfactory survival and markedly improved growth.

Porosity has been studied in great detail, and it is only possible to mention one or two of the more obvious, but not necessarily the most important, practical conclusions. Deep ploughing hardly alters the porosity under the ridges, so that, on normal ploughing (4 ft. 6 in. between ridges) some 38 per cent. of the land is left with its original poor aeration. The aeration of the inverted and undisturbed peat horizons, however, is greatly increased, and on the lighter soils this can result in much improved humus conditions. The effect of trees on porosity has been the subject of a number of comparative tests. It is noteworthy that even with shallow ploughing aeration under 20-years-old Sitka spruce is improved down to 60 cms. depth throughout the year. This demonstrable improvement in aeration as the result of tree growth is a factor of considerable importance, suggesting that it would be unwise to expose the soil at any time to the compacting action of rainfall on an unvegetated surface.

The rooting habits of both tree and moorland species have been studied, with interesting results. The fact that *Calluna* roots can reach below the pan, presumably through small fissures, suggests that tree roots might be able to follow; on some sites, indeed, Scots pine can do so, whilst in places Sitka spruce can be surprisingly deep-rooting.

Consideration of the growth of trees shows that not only ploughing before planting, but also temporary cultivation for agriculture during the last 200 years still affects survival and growth considerably.

Acknowledgment must be made of the excellent and painstaking laboratory work of Miss S. J. Russell, whilst the unstinted help and co-operation offered by State Forest Officer P. F. Garthwaite and his

staff, and by Head Research Forester J. Weatherell, are greatly appreciated.

Soil Fauna. During the past year soil fauna investigations by Mr. P. W. Murphy have been concerned with a continuation of identification and assessment of samples to complete the projects outlined in earlier reports. In this sphere the soil faunal survey of natural and afforested heathland has occupied a considerable portion of the time. Much time has also been devoted to a biological study of certain members of the soil *Acari,* and whilst most of this work is exploratory in nature, some interesting facts have been revealed together with indications of fruitful lines of investigation for the future. These experiments have clearly shown the limitations of present methods, and though in the absence of convenient alternatives they must still be used, it is likely that a reorientation of approach will be necessary before real advances can be made in this branch of soil biology.

Population Survey in the Allerston area, Yorkshire. The results obtained with improved extraction technique indicate remarkably large numbers of organisms in the undisturbed heathland, high even in comparison with the figures reported by other workers for grassland and arable soil.

Samples from the cultivated and planted heathland have been obtained from experimental plots planted with Sitka spruce now about 20 years old. In the better plots the trees have reached canopy. Deep samples from these sites show some interesting features. There is an increase in numbers and biomass: this has occurred partly in the litter layer on the surface, but partly in the raw humus 'sandwich' formed during the ploughing process where about 50 per cent of the population occurs. In addition, more organisms occur in the mineral soil, especially in the layer above the humus 'sandwich.' Frequently the latter contains large numbers of dead mites; the explanation of this is not clear at present and further investigation is needed. Unfortunately the crumbly nature of the raw humus makes assessment a very difficult and lengthy process. Some samples were studied where birch litter had been placed on the heathland. It was found that though the counts of *Acari* were not very different, numbers of *Collembola* tend to be higher and that *Enchytraeid* worms were present.

Biological studies. Investigations into the biology of soil *Acari* have continued. Further improvements have been made in culture methods and a culture technique devised which has proved reasonably successful. Mr. J. A. Spencer, a student in the Department, carried out, under Mr. Murphy's supervision, an investigation into the food habits of certain species.

Studies of the life histories of soil *Acari* have been continued but progress has been rather slow. This is partly due to the limitations of present culture methods, as many of the mites, especially in the larval stages, are extremely sensitive to adverse conditions.

Miscellaneous activities. Some experiments were made with phase contrast microscopy for the examination of *Acari*, and it was found to be a valuable tool for the examination of certain species. Mr. Murphy is much indebted for the advice and assistance he has received from Dr. Robert Barer of the Department of Human Anatomy, University of Oxford. A paper with photomicrographs illustrating the possibilities of phase contrast microscopy in this sphere will be published shortly under the joint authorship of Dr. Barer and Mr. P. W. Murphy.

The valuable help of Dr. F. A. Turk and Dr. G. O. Evans is gratefully acknowledged.

FOREST BOTANY

The Forest Herbarium still remains in the old Forestry building but is expected to be transferred to accommodation in the new building of the Department of Botany in September, 1951. The Curator, Mr. A. C. Hoyle, reported that 1,441 specimens were received, as compared with 1,013 during the previous year, and 1,495 were prepared for incorporation in the herbarium.

During the year a total of 491 specimens were received for determination from the following territories: Bechuanaland (16), Gold Coast (28), Kenya (82), Nigeria (51), Nyasaland (9), Papua and New Guinea (57), Southern Rhodesia (114), Sudan (51) and Uganda (83). The majority have been determined, listed, and, when desirable mounted and filed in the herbarium. Most of the material remaining to be identified (the accumulation of several years) belongs to critical or confused groups; these are receiving attention, when relevant, in connection with the Northern Rhodesian Check-List, which is the major task in hand. Several, including *Ficus, Grewia, Acacia* and *Pterocarpus* have thus been dealt with during the year.

Teaching. Mr. Hoyle gave the usual courses in Taxonomy, with the assistance of Mr. F. White, Forest Botanist.

Research. Taxonomic studies of African species of *Diospyros, Pterocarpus* and *Parinari* were continued by Mr. White throughout the year, and valuable material of all three genera has been collected in the field by Forest Officers and others, and received in the herbarium for study. Through the kindness of their Directors, several hundred sheets of *Diospyros* have been received on loan from British and Continental herbaria. The first of a series of papers on *Diospyros* has been prepared for the press. Mr. Hoyle continued his study of *Brachystegia* and *Isoberlinia* and identified collections of these genera received from the Department of Agriculture in Portuguese East Africa, and prepared a revision of *Brachystegia* for the new *Flore du Congo.*

Mr. M. F. H. Abraham made a study of natural regeneration of the Camphor Forests of Mount Kenya, supplementing the data collected by Mr. White in 1949 with more collected by himself. It is hoped to publish the results after a second visit to Mount Kenya which Mr. White hopes to undertake on his way back to England

from Northern Rhodesia in 1952. Mr. Musa Daggash prepared a key to the Nigerian species of *Acacia*.

In January, 1951, Mr. A. Angus, a graduate in Botany of Edinburgh University, was appointed for three years to assist Mr. White in the compilation of an annotated check-list of the trees and shrubs of Northern Rhodesia; this was rendered possible through a special grant from the Colonial Development and Welfare Fund. After a period of training lasting about three months, Mr. Angus started work, and the following families have been written up since then: *Mimosaceae, Papilionaceae, Tiliaceae, Moraceae, Euphorbiaceae* and a number of smaller groups. As many of the species are incompletely represented in British herbaria, and very little information is available about field-characters and ecological requirements, it has been arranged that Mr. White should spend the greater part of 1952 in Northern Rhodesia, and Mr. Angus about six months, from June to December. Work on the check-list has entailed frequent visits to the herbaria at Kew and the British Museum to study specimens not available in Oxford.

FOREST PATHOLOGY

Mr. W. R. Day continued in charge of this Section, with Mr. F. H. Jones as senior assistant and Mr. D. K. Barrett and Mrs. Hollely as junior assistants. Miss Rose took Mrs. Hollely's place during the last three months. The technical staff gave able assistance throughout.

Teaching. The usual courses of instruction were given for the final schools and the special short course in forest hygiene for the post-graduate students.

Research. (1) *The drought crack of conifers.* A report on this work was sent in to the Forestry Commission and will in due course be published by them.

A visit paid in April, 1951, to the Novar estate in eastern Rossshire, on the recommendation of Mr. James Fraser, Conservator for Northern Scotland, Forestry Commission, showed that drought crack occurred on *Abies grandis, Tsuga heterophylla, Pseudotsuga taxifolia* and *Picea sitchensis*. *Abies grandis* was the most severely affected.

The examination in 1950 of the main stems of six Sitka spruce cracked in 1947 in plantations in eastern Aberdeenshire showed the general presence of *Fomes annosus* and the more limited occurrence of *Graphium penicilloides*, a fungus capable of causing blue stain. It is not known whether *Fomes annosus* was an initial infection after cracking, whether it entered secondarily, or whether it represents an infection which occurs generally irrespective of drought: it is proposed to investigate this further during the coming year.

(2) *Root disease of conifers in relation to soil conditions.* (*a*) *Development of Butt-rot in conifers in relation to soil depth.* A request to report on the occurrence of butt-rot associated with *Fomes*

annosus in European larch led to an investigation of the relationship between rooting depth, drainage conditions and the occurrence of root disease and butt-rot on various sites in Scotland during a tour made in April, 1951. A report on this was sent in towards the end of the year. An examination of the soil conditions on the sites of temporary Sample Plots made after the First World War was combined with this.

The species of tree concerned were European larch, Hybrid larch, Western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*) and also Douglas fir (*Pseudotsuga taxifolia*). The sites examined were well drained topographically, but showed an appreciable degree of compaction, or impedance in drainage, in the subsoil. The soil types were principally brown forest soils, or brown podzols, but in two cases grey podzols occurred, though without any iron pan. Generally speaking the upper soil layers, in which root development mainly occurred, were of good structure and adequate fertility. Under these circumstances the investigation showed plainly that the development of root disease, with subsequent infection and butt-rot by *Fomes annosus*, was related to soil depth as being a principal factor determining the adequacy of growing space and supply conditions for root development and action. In the sites investigated, root disease and butt-rot became more severe the nearer the underlying unfavourable subsoil was to the surface. Equally, where trees of timber size had been grown, with little or no butt-rot, the sites were consistently characterized by relative satisfactory depth and favourable topographical position as regards water supply.

(*b*) *The dying of Sitka spruce.* Continuing last year's work, examples of Norway and Sitka spruce were investigated in Newcastleton Forest, Dumfriesshire, where the trees were dead or dying in small patches on acid clay soils thinly covered by peaty raw humus. These trees were rooted comparatively deeply in heavy clay soil the surface of which was more or less leached. The situations were freely draining topographically, though from the nature of the soil drainage downwards was highly impeded. No attempt was made to isolate any parasite, but both species showed a complete absence of any obvious mycelium, and it may be taken that it is unlikely that any of the common higher fungi associated with root disease were present.

The feature of these root systems was the relatively good development of the main root framework, both horizontally and in depth, combined with a very poor development of the finer feeding roots everywhere except in the thin surface humus layer. These soils were examined at the end of a wet winter but contained no free water, though the clay was plastic. The occurrence of dead trees has been noticed within the last year or two, and the opinion arrived at as to the cause of disease is that it is fundamentally determined by the poor conditions of water supply during really dry periods, in soils which encourage an extensive but relatively inefficient development of the root system. Examination showed that large superficial roots

were dead on trees which still bore green crowns, and there can be no doubt that the disease is more extensive than the relatively small number of dead trees indicates.

(3) *The fungus flora of apparently living trees.* This work is still proceeding though there is nothing further specially to report at present.

(4) *Bark necrosis in various species.* (*a*) *Beech.* The work reported last year on the dying of bark on beech in Bagley Wood has been continued and will be carried on into next year.

(*b*) *Ash.* Preliminary work in connection with bacterial canker of ash was carried out by Mr. J. D. Garrad as a special subject for the final examination. Evidence was produced that the initial injuries in canker development occur in the spring before the buds break, but after the formation of new wood has begun. There were suggestions that frost was often responsible for these initial injuries, but also plainly that bacteria are associated very early with their development. Further work will be needed before the exact sequence of events in the development of this disease is known.

(*c*) *European larch.* The work on the seasonal development and extension of larch cankers and the fungus flora occurring in them has continued. Special attention is now being paid to the fungus flora isolated, but it is not possible to make any report yet with regard to this. Mr. M. Wright worked on this problem as a special subject for his final examination.

(5) *Abnormal anatomy of conifer stems affected by cambial injury.* The cambial injuries which result in the death of bark on the main stems of spruce and Japanese larch (Day, *Forest Record* No. 4, H.M.S.O., 1950) also result in the coincident development of abnormal tissue in other parts of the stem. This has been under study: progress up to date indicates that the local death of bark is a special aspect of more general but less severe injury to the cambium which results in the development of abnormal tissue in the wood. Considerable length of main stem may be affected in this way, so that the total effect is much more extensive than the local areas of dead bark suggest. This type of injury has not been discovered, so far, until several years after its occurrence; for that reason nothing satisfactory is known regarding the fungus colonisation of the areas of bark which are killed. There are no indications from the anatomy of affected stems that any parasite has played an important part in this; but proof of the manner and type of fungus colonisation must wait until newly developing injuries are found.

(6) *Death, die-back and canker of Pinus contorta* (*Lodgepole pine*). Two instances of die-back of this species were examined during the year. The causes of dying back appear principally to have been root disease associated with poor drainage conditions on a peat soil and frost injury. It is quite clear that some strains of Lodgepole pine are susceptible to frost injury of a serious nature in this country and that, for this reason alone, care in the selection of strains is needed.

FOREST ENTOMOLOGY

Dr. R. N. Chrystal continued in charge of the Section, with Mr. G. H. Thompson as assistant entomologist and Mr. E. R. Skinner as assistant.

Teaching. Courses of instruction in forest zoology and entomology were given during Hilary and Trinity terms, together with field demonstrations. An advanced course in forest entomology was conducted by Mr. Thompson for a group of students choosing this subject for their final examination. During the year instruction in forest entomology was also given by Dr. Chrystal at the Forestry Commission's Training Schools in the Forests of Dean, Norfolk, North Wales, Peebles and Argyll (Benmore).

Research. (1) *Douglas fir Adelges.* The investigation begun in 1947 on the effect of pruning Douglas fir in Coed-y-Brenin Forest, North Wales, has provided some interesting data. The trees averaged 16–18 feet high, and selected strips, $\frac{3}{4}$ of an acre each, were green-pruned to a height of 6 feet. Removal of the lower whorls reduced the *Adelges* population, which was considerable, by about two-thirds, and also greatly reduced the denser foliage which favours a concentration of the over-wintering *sistens* population. The numbers of the insects in the pruned trees have, generally speaking, remained at a considerably lower level than in the unpruned trees. Green pruning has not apparently had any adverse effect on trees which have now reached a height of 30 to 35 feet. Annual comparative studies in pruned and unpruned areas have been made. The two sets of trees are very similar in height and girth growth, despite the fact that the unpruned trees carried a considerably larger *Adelges* population over the period.

This season's observations show that the trees in both areas have again become closely comparable as regards foliage density, canopy being now closed. All needle-bearing branches have now died off up to an average height of 9 feet. The evidence collected so far suggests that a considerably larger *Adelges* population than we have ever encountered in the field would be required to produce a 'checked' condition ascribable to the insect in Douglas which has reached the later thicket stages. No checked condition, associated with *Adelges,* has so far been observed on Douglas up to a height of 5–6 feet. Experimental trees of this size, artificially infected with a heavy population of *Adelges* four years ago, have retained equal vigour with control trees kept free of infection. Further, it has been observed that Douglas showing a fairly high degree of attack compare not unfavourably as regards growth rate with trees which have largely escaped attack by the insect.

Trees with dense foliage attract a large *Adelges* population which concentrates in the lower denser regions of the trees. The *sistens* have a marked preference for this micro habitat, and it is noteworthy that trees with this noticeably dense branching and foliage often show a lower growth rate which may be linked with the more fundamental factors affecting tree growth.

(2) *The Clay Weevil, Otiorrhynchus picipes* D. The work on this insect undertaken in collaboration with Mr. A. Bayne of Ashbourne, Derbyshire, has now been completed and published.

Tours, etc. During the year Mr. Thompson paid a visit to the State Entomological Research Station in Stockholm, Sweden, at the invitation of Professor V. Butovitsch. From there he made several tours of forest insect field stations, and field projects in Central and Southern Sweden, and attended an entomological meeting in West Germany. In May, 1951, he left for Canada to undertake a tour of the principal centres of forest entomological research in the Dominion. This tour was made possible by the kindly co-operation and help of the Division of Forest Biology of the Dominion Science Service. All the major laboratories and most of the field stations were visited, from New Brunswick to British Columbia, and the greatest possible kindness and assistance were everywhere encountered. Items of particular interest were: the organization of the Forest Insect Survey, which accounts for the largest individual expenditure in the Division; ecological studies of a detailed nature concerning the spruce and black-headed budworm, larch sawfly, hemlock hooper, balsam woolly aphid and other insect species; and fundamental research into the use of viruses, bacteria and fungi as possible control agents for forest insects.

MANAGEMENT

As noted above, Dr. Anderson completed a working plan for Bagley Wood which will be introduced in 1951-52. Both Bagley and Wytham Woods — the latter now in the third year of its plan — should become increasingly valuable for teaching purposes as the period they have been under planned management lengthens.

Courses of lectures were given by Mr. N. V. Brasnett and Dr. M. L. Anderson as usual. The working plan exercise was carried out in the New Forest, where the month of September was spent by the junior year in the collection and recording of information, and a fortnight in the following Easter vacation by the same men as seniors in organising and planning the future management of the area.

Three students who had done the first part of their work in an area of High Meadow Woods before going out to the colonies as probationary officers, returned there in the Easter vacation to complete their plans.

The standard of most of the plans submitted was good. They naturally tended to be somewhat academic because of the necessity of providing as complete a training as possible in detailed description, recognition of site differences, and preparation of schedules for intensive operations, crop valuations and financial forecasts. Stress is laid on the importance of adapting management planning to the practical limitations of any particular set of conditions which are met.

The usual ten-day tour was made by the junior year and others in the Easter vacation to study the simpler forms of French manage-

ment in Normandy and the Landes region. Management in the more difficult mountainous areas of the Vosges, Jura and Switzerland was seen by all the Colonial Forest Officers, and the detailed methods of the Dutch by the senior undergraduates in July. Several of the colonial forest officers made special studies of management planning and its possible developments in Africa.

Copies of working plans were received from India, Northern Rhodesia, the Anglo-Egyptian Sudan, Kenya and Uganda during the year, and the Institute is very grateful to the departments and individuals who provided this valuable training material.

MENSURATION

The regular courses were conducted by Dr. M. L. Anderson with practical work in Bagley Wood, including a full remeasurement of a sample plot of *Abies grandis* (40 years old). An advanced course on selection points was given for post-graduate students.

STATISTICAL SECTION

As last year, Mr. M. R. Sampford gave a course of lectures on elementary statistics for Forestry students and some students attended Mr. D. J. Finney's seminars on statistical methods for scientists.

The Institute computer, Miss J. Smith, was mainly occupied with work for the sections of Forest Pathology, Soil Fauna and Tree Physiology.

WOOD STRUCTURE

Dr. L. Chalk continued in charge of the Section, with Mr. A. A. Shaw and Mr. P. G. H. Franklin as assistants. The move to the new building was completed during the year and the main wood collection was rearranged in its new quarters, where a separate room is available for it. There is still a residue of collections, received and put into store during the war, that has yet to be incorporated.

Teaching. The usual undergraduate and post-graduate courses were given and three students undertook work in this section for their 'special subject' in the Honours School.

Research. (1) *Variation in the density of Douglas fir.* A small investigation was completed on some material provided by G. Penn Barrow, Esq. It was found that access by the roots to a permanent water table significantly increased the formation of summer wood.

(2) *Shrinkage.* F. W. Lindsay investigated the shrinkage of ray and ray-free tissue dissected from sections of three woods with large rays, and found that the ray tissue shrank significantly less than the other tissues radially but more longitudinally. A technique was developed for measuring this difference by the curvature of thin strips of sections containing varying proportions of ray tissue down one side. This produces curvature in proportion to the amount of ray

tissue included. Large rays in dried cross sections showed bulging perceptible on the tangential edges, compared with the edge of the intervening tissues.

D. T. Carter used the above technique with the smaller rays of *Carapa* and *Swietenia*, but found indications that the ray-free tissue also shrinks less radially than tangentially. Both radial and tangential shrinkage were greater in *Carapa* than in *Swietenia*.

Wood Collection. The principal additions to the wood collection were received from the following: Colonial Forest Departments of Kenya, Malaya, Nigeria and Tanganyika, Mr. A. C. Hoyle and Mr. H. C. King.

FOREST ECONOMICS

Mr. J. J. MacGregor continued in charge of this Section with Mr. F. E. Balman as assistant.

Teaching. Courses of lectures and tutorials were provided for the Honour School of Forestry on general economic theory and forest economics, and the optional subject of 'British Forest Law, Land Tenure and Taxation.' Seminars based on study groups covering the main economic problems of individual colonies were arranged for the Colonial Probationary Officers. The diagrams prepared for the Exhibition which marked the opening of the New Building proved very useful in teaching.

Research. At the request of the Economic Commission for Europe, a report was prepared showing the trend of production, supplies, consumption and prices of timber and timber products in the United Kingdom since 1900. The main function of the report was to provide an interpretative text about present trends and future prospects. It formed part of a general study which the Economic Commission was undertaking of timber consumption in Europe as a whole.

During the year, at the request of the Forestry Commission, arrangements have been made to start an extensive investigation into private forestry costs in England and Wales. Besides providing a regular flow of information and data on the economic aspects of private forestry, the survey of costing data will provide the basis for the review of planting and maintenance grants under the Dedication Scheme established in the Forestry Act of 1947. (A similar survey is being conducted for Scotland from the Department of Forestry at Aberdeen University.) The Forestry Commission has provided a grant for this survey, which will have a somewhat similar function to that conducted by the Agricultural Economists attached to University Departments on behalf of the Ministry of Agriculture.

At the request of the Agricultural Economics Society, the Forest Economist read a paper entitled 'The Political Economy of British Forestry' at the 1951 Summer Conference of the Society.

COLONIAL FOREST ADMINISTRATION

The usual course of lectures was given by Mr. N. V. Brasnett. Many of the discussions held by the Dominion and Colonial Officers' Group were of administrative problems and the most recent ways of meeting them in various countries. Three candidates satisfied the examiners in this subject in the Honours School.

FOREST ENGINEERING AND UTILIZATION

Teaching courses of lectures in Forest Engineering and in Utilization were given as usual to undergraduate students, and a course of eight lectures and practical work was given to Colonial Probationers on timber extraction, conversion and saw-milling. A road alignment was, as usual, carried out on the Wytham Estate by both Degree Students and Probationers.

Demonstrations were also given on marshy ground near Newbury of timber extraction and loading with winches by Unipower four-wheel-drive tractors. Tree uprooting by Trewhella winch and cross-cutting by chain saws were demonstrated in the Wytham Woods. The use of mechanically operated cableways for timber extraction was seen in the Vosges during the Continental tour.

Thirty-one Forest Probationers and senior year undergraduate students attended a special course of lectures and demonstrations at the Forest Products Research Laboratory at Princes Risborough during the Christmas vacation. Our thanks are again due to the Director and to the Public Relations Officer for planning a very comprehensive course.

Colonel Lloyd continued his study of various types of cableways during a tour in Switzerland and visited experimental work in Scotland on a small light portable mechanical cableway being done by the Engineering Section, Forestry Commission, and also by a timber firm interested in the extraction of early thinnings from plantations in difficult terrain.

Utilization excursions included visits to Glikstens' and Mallinson's sawmills and timber yards in London, furniture factories in High Wycombe and a compressed plywood factory at Haddenham.

Visit to Central and East African Colonies. Colonel Lloyd paid a three months' visit to Africa during the year under special arrangements made by the Colonial Office with the Colonies concerned. The main object of the tour was to study local methods of timber felling, extraction and conversion in Africa as a basis for the lecture courses in Forest Engineering and Utilization given to Colonial Forest Officers and Probationers at this Institute. He had also been asked to advise on the practicability of the use of mechanically operated cableways for timber extraction in difficult terrain in Nyasaland. On his return journey he was asked for similar advice in the Southern Sudan, and as a result of his visit cableways are now under installation in both these countries, and a small party of Swiss experts are training local African labour in the construction and operation of the cableways.

FOREST PROTECTION

A course of lectures on soil erosion and fire protection was given by Colonel Lloyd, other aspects of the subject being incorporated in courses on silviculture and management.

SURVEYING

Mr. A. R. Robbins, University Lecturer in Surveying, gave the usual course on surveying in the Trinity term. He also gave a joint course with Dr. Dimbleby on aerial survey and photographic interpretation as in previous years.

LIBRARY

Staff. There was no change in the staff consisting of the Librarian, two Assistant Librarians and two other members.

Accessions during the year:

Issues of periodicals	1,734	(1,632)
Books	177	(223)
Other items	2,222	(1,285)
Totals	4,135	(3,140)

Notes: Figures in brackets are those of the previous year. Three (6) books were purchased through the Brooks Memorial Fund: the Library was presented with 327 (210) items by the Commonwealth Forestry Bureau and with 200 (137) by other institutions and persons. Individual donors are named later in this Report.

Loans:

To staff	3,865	(2,434)
To students	1,109	(2,075)
To the Bureau	865	(713)
To visitors and correspondents ...	560	(484)
Total loans	6,399	(5,706)

The ample space for readers in the new library, and some restriction on circulation of periodicals (current issues now being on display for a period after receipt), have, as expected, considerably reduced the number of loans to students and visitors.

Visitors included persons from Athens, Brazil, Ceylon, Fiji, Finland, Germany, Israel, Kenya, Nigeria, Malaya, Norway, Switzerland, Western Australia and U.S.A.

New Periodicals. Issues of nineteen new journals were received: four English, two American, three African (Johannesburg, Portuguese Africa and the Sudan), three German (two from the Russian Zone), and one each from Australia, Japan, Pakistan, Philippines, Turkey, Wales and Yugoslavia.

New Series. Forty-nine separate new headings of Circulars, Bulletins, Reports, etc., were entered : the total number of series held is now about 2,540, 960 of them still current.

Correspondence. Letters sent (including requests), 1,367 ; received, 1,037. Fewer requests for literature have had to be sent out, as several institutions, notably the United States Department of Agriculture and Forest Service, have begun sending their publications to the 'Agricultural Pool' in England, whence items of forestry interest are eventually directed to this library.

Catalogue Room. The year under review has been the most eventful in the post-war history of the Institute's catalogues.

Preparations for the impending move of the index to the new building took up most of the early part of the year. There was an unfortunate delay in the delivery of the timber for the floor of the room, but the move, involving twenty-nine twelve-drawer cabinets weighing nearly one ton, was completed just in time for the opening by H.R.H. Princess Margaret. Serious consideration has been given to the problem of the ever increasing number of new cards, and the possibility of the catalogues having to cope with 20,000 per year. At the same time the Director of the Commonwealth Forestry Bureau was seeking some way in which he could offer to other forest departments, and industries dependent on forestry research, copies of the references passed to the Institute. Solution to both problems came with the purchase of a spirit duplicating machine, and a slight adjustment in the organisation of the staff of the Bureau and Institute. The Bureau now sends the Institute typed master copies which are duplicated on the new machine, providing the requirements of both Bureau and Institute with the extra copies already required for Princes Risborough, Alice Holt and Fiji.

The 'Oxford Classification' has been introduced, having been developed by the Bureau out of the old Flury system which it replaces. This change involved the closing of the card indexes which had been built up since 1934. The Author Catalogue is being continued to embrace both classifications, but for geographical and subject consultations the user must in each case now seek two separate catalogues.

16,764 cards have been filed during 1950/51. Reproductions for distribution total 5,119, *viz.* 694 for Alice Holt, 2,370 for Princes Risborough and 1,055 for Fiji.

Library Bulletin. Regular mimeographed issues six times yearly (once during each term and vacation) are now appearing ; the *Bulletin* fulfils the useful function of prompt announcement of recent accessions and other library news. It is circulated to the staff of the Department and a few co-operating libraries.

Basic Library List. With the much appreciated help of the Bureau, a completely new issue was prepared, displacing that issued in 1942. Its 20 mimeographed pages give full details, including current prices where possible, of books recommended for the libraries of Colonial and other Forestry Departments. About 50 copies had been distributed by post at the end of the period. Supplements will be issued at intervals.

General. Some progress was made with binding and repairing on the premises, an activity hitherto precluded by lack of space. An expert binder dealt with about 60 items, chiefly pamphlets. A cataloguer from the National Central Library, London, spent several days in the library noting details for the Russian Union Catalogue; the German Union Catalogue work was continued by our own staff. A major rearrangement of pamphlets and periodicals, delayed until the arrival of certain equipment, was begun as soon as Trinity Term ended; much material in the basement is thereby brought into the main library.

Acknowledgments. The kindness of many donors of books is gratefully acknowledged, among them Professor Knuchel of Zürich, a copy of whose work, *Planung und Kontrolle im Forstbetrieb,* was presented to mark the official opening of the Department; Dr. M. L. Anderson, two books, *Selection of Tree Species* and *Northern Coniferous Forest Soils,* translated from the Swedish of Olaf Tamm; Dr. A. P. Kelly, *Mycotrophy in Plants*; Mr. Vahid, Inspector-General of Forests, Pakistan, two publications; Monsieur D. Normand, *Atlas des Bois de la Côte d'Ivoire,* Vol. I; Dr. Ph. Guinier, a number of reprints and papers. Mrs. Mead and Mr. Benskin gave us a quantity of unusual and immediately useful published material from Malaya and Germany respectively; Mr. H. R. Blanford, a collection of Burma Working Plans, most of them new to us; Professor Osborn and Capt. H. S. Blunt, scarce nineteenth-century books. By bequest from Mrs. Eyres Simmons, who as Dr. Helen Bancroft was a former member of our staff, the library acquired an especially interesting addendum. Other donors include Dr. Chrystal; Dr. C. M. Baeta Neves of Lisbon; the Department of Agriculture; the British National Book Centre; the Forestry Commission; the Colonial Office; the Macaulay Institute for Soil Research; the Royal College of Veterinary Surgeons; the Society of American Foresters; and the United States Department of Agriculture.

PHOTOGRAPHIC SECTION

There has been a steady increase in the demands on the Photographic Section, staffed by Mr. H. F. Woodward and one assistant. In connection with the Opening Exhibition over 200 enlargements up to 20 in. × 16 in., of special quality and finish, together with a number of large transparencies and photomicrographs, were produced. The total number of prints and enlargements made during the year amounted to 4,875. 320 photographs and photomicrographs were taken, 1,162 negatives processed, 80 lantern slides made, and a number of miscellaneous items such as measuring graticules, optical wedges and photographic stencils were produced. An item of special interest was the reflex copying of 400 pages of a book, using a photographic paper with emulsion on both sides, which gave the appearance in the finished article of normal book pages and at the same time halving the bulk.

Work on the photograph collection has included routine repairs, further cross-referencing and classification and the addition of 663 new photographs.

There has also been a marked increase in the amount of duplicating work passing through the Section, the total number of impressions approaching 80,000.

WORKSHOPS

The Workshops continued with one metal-worker, Mr. E. J. Howell, and one wood-worker, Mr. J. Howkins. Owing to the increasing demands on this Section a second full-time metal-worker, Mr. J. Hanson, was engaged.

The following pieces of apparatus have been constructed, in addition to routine work and numerous smaller items:

Metal-work

- Copper steam bath
- Trolleys for air and oxygen cylinders
- Punching machine for insect mounts
- 25 rain gauges
- Screw press
- Vernier gauge for measuring loss of water by evaporation
- Sap extractor press

Wood-work

- Insect breeding cages
- Under-bench units for storage of lantern slides
- Dust extractor
- Cupboard with sliding blackboards
- Library steps

FINANCE

The audited accounts of the Department will be published in the *Oxford University Abstracts of Accounts*. The following is a summary of income and expenditure for the year:

General Account

Income. Forestry Commission, General Education, £5,878; Forestry Commission, Special Grants, £4,844; Colonies, £4,980; Colonial Development and Welfare Fund, £11,050; Colonial Office, Special Grant, £371; Curators of the University Chest, £14,525; Dominions, India and others, £1,003; sale of publications, £102; other receipts, £322. Total income, £43,075.

Expenditure. Staff salaries and pension contributions, £32,794; instructional supplies, £3,414; furniture, £293; travelling, £1,825; general expenses, £1,697; Library expenses, £533; publications, £68; 'Premises' expenses, £2,656. Total expenditure, £43,280.

Capital Account

There is held in the Capital Account the sum of £12,272. The income for the year from investments was £284.

APPENDIX I

PUBLICATIONS

GENERAL

Original Papers

The Silver Jubilee of the Imperial Forestry Institute, Oxford, by H. G. Champion. *Journal of Forestry, Washington,* Vol. 49: 485-6.

The Place of Forestry in the Countryside, by H. G. Champion. *Country Life.*

Forestry Developments in Great Britain, the Commonwealth and Europe in 1950, by A. H. Lloyd. *Encyclopaedia Britannica* 'Book of the Year' for 1951.

Reviews and Notices

Meeting of the British Association for the Advancement of Science, Birmingham, August 30—September 6, 1950, by H. G. Champion. *Unasylva,* Vol. IV: 187-8.

The New Imperial Forestry Institute, Oxford, by H. G. Champion. *Nature,* Vol. 166: 818-9.

The New Imperial Forestry Institute, University of Oxford, by H. G. Champion. *Unasylva,* Vol. V: 23-4.

Forest Terminology: Society of American Foresters, Revised Edition, Washington, 1950. *Empire Forestry Review,* Vol. 29: 366. (*H. G. Champion.*)

Thirtieth Annual Report of the Forestry Commissioners for the year ending September 30, 1949. *Forestry,* Vol. XXIV: 163-5. (*H. G. Champion.*)

F.A.O. Forestry Mission to Ireland, 1950. *Empire Forestry Review,* Vol. 30: 184-5. (*M. L. Anderson.*)

Administration Reports: Tanganyika Territory, 1948; Uganda Protectorate, 1949; *Empire Forestry Review,* Vol. 29: 387-90. Northern Rhodesia, 1949; Nyasaland Protectorate, 1949; *Empire Forestry Review,* Vol. 30: 106-7 and 198-200. Northern Rhodesia, 1950; *Empire Forestry Review,* Vol. 30: 299-301. (*N. V. Brasnett.*)

SILVICULTURE

Reviews

Maintenance of Fertility in Dry Coffee Soils, by H. C. Periera and P. A. Jones. *Empire Forestry Review,* Vol. 30: 62-3. (*N. V. Brasnett.*)

Waldbau, by Josef Köstler. *Journal of Ecology.* (*E. W. Jones.*)

The Selection of Tree Species, by M. L. Anderson. *Journal of Ecology.* (*E. W. Jones.*)

Woody Plant Seed Manual, U.S. Department of Agriculture. *Empire Forestry Review,* Vol. 30: 82-3. (*H. G. Champion.*)

Applied Silviculture in the U.S., by Professor R. H. Westveld, 2nd Edition. *Nature,* Vol. 167 : 575-6. (*H. G. Champion.*)

Principles of Silviculture, by F. S. Baker. *Forestry,* Vol. XXIV : 166-7. (*H. G. Champion.*)

ECOLOGY

Original Papers

The Forests of Mt. Kenya, by F. White. *Forest Society Journal,* Third Series, No. 5, 32-8 ; 1950.

Notes on Calcicolous Communities and Peat Formation in Norwegian Lappland, by D. E. Coombe and F. White. *Journal of Ecology,* Vol. 39 : 33-62 ; 1951.

Reviews

Some remarks on the Classification of Forestry Types according to their mode of origin, by E. Meyer Drees, *Tectona,* Del. XXX, No. 3, June 1950. *Empire Forestry Review,* Vol. 30: 91. (*G. W. Dimbleby.*)

Distribution of Tree Species in the Sudan in relation to Rainfall and Soil Texture, by J. Smith. *Empire Forestry Review,* Vol. 30 : 280-1. (*G. W. Dimbleby.*)

The Deciduous Forests of Eastern Northern America, by E. Lucy Braun. *The New Phytologist,* Vol. 50, No. 3. (*E. W. Jones.*)

Arboreal Flora of Israel and Transjordan and its Ecological and Phytogeographical Significance, by M. Zohary. (Edited by F. White.)

FOREST BOTANY

Original Paper

Notes on Five West African Species of *Cissus* Linn., by F. White. *Kew Bulletin,* 1950 : 53-62.

FOREST PATHOLOGY

Original Papers

Forest Hygiene, II. The Imperfection of the Environment and its importance in the Management of Forests, by W. R. Day. *Empire Forestry Review,* Vol. 29: 307-15.

The susceptibility to injury by experimental freezing of strains of European Larch (*Larix decidua* Mill.) of varying geographical origin, by W. R. Day. *Forestry,* XXIV : 40-56.

A note on the dying of Norway and Sitka spruce, Newcastleton Forests, by W. R. Day. Report to the Forestry Commission, April, 1950.

Restriction in depth of rooting in relation to the Development of Root Disease and Butt Rot and in connection with the practice

of underplanting, by W. R. Day. Report to the Forestry Commission.

A summary statement of types of damage caused by fluorine fumes and of injuries and types of disease likely to be confused with them or to occur coincidentally, by W. R. Day. Report to the Forestry Commission.

FOREST MANAGEMENT

Reviews

Working Plan for the South Mengo Forests, Uganda, for the period 1948-57, by R. G. Sangster. *Empire Forestry Review,* Vol. 29: 371-3. (*N. V. Brasnett.*)

Working Plan for the Forest Reserves of the Southern Blue Nile Circle, Sudan, by G. A. Booth. *Empire Forestry Review,* Vol. 30: 186-8. (*N. V. Brasnett.*)

A Fallacy in the Theory of Growing Stock, by R. Bourne. *Forestry,* Vol. 24: 6-18; 1951. *Empire Forestry Review,* Vol. 30: 283-5. (*N. V. Brasnett.*)

Suggested Changes in Determining the Allowable Cut applicable to Philippine Dipterocarp Forest, by N. P. Lalog, in *The Philippine Journal of Forestry,* Vol. 6, No. 3, 1949. *Empire Forestry Review,* Vol. 30: 285-6. (*N. V. Brasnett.*)

FOREST MENSURATION

Reviews

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APPENDIX II

STAFF

I. STAFF ENGAGED IN INSTRUCTION AND RESEARCH

Professor H. G. Champion, C.I.E., D.Sc., M.A. (Oxon.). Tropical Forestry, Forest Policy.

L. Chalk, M.A., D.Phil. (Oxon.). Wood Structure and Properties.

W. R. Day, M.A., B.Sc. (Oxon.). Pathology, Forest Hygiene.

A. H. Lloyd, O.B.E., M.C., T.D., M.A. (Oxon.). Forest Engineering and Utilisation.

R. N. Chrystal, D.Sc. (Edin.), Hon. M.A. (Oxon.). Forest Zoology.

G. H. Thompson, B.Sc. (Oxon.). Forest Zoology.

N. V. Brasnett, M.A., Dip. For. (Cantab.). Forest Management.

M. L. Anderson, M.C., M.A. (Oxon.), D.Sc. (Edin.). Mensuration.

J. J. MacGregor, B.Sc. (Glasgow), M.S. (Wisc.), B.Litt., M.A. (Oxon.). Forest Economics.

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G. W. Dimbleby, M.A., D.Phil. (Oxon.). Forest Ecology.

F. White, B.A. (Cantab.). Forest Botany.

P. J. Rennie, B.Sc. (Lond.). Soil Research.

P E. W. Murphy, B.Agr.Sci. (Dublin). Soil Research.

A. Angus, B.Sc. (Edin.). Forest Botany.

II. STAFF OF OTHER UNIVERSITY DEPARTMENTS ASSISTING IN INSTRUCTIONAL WORK

A. C. Hoyle, M.A., B.Sc. (Oxon.). Forest Botany and Ecology.

E. W. Russell, M.A. (Oxon.), Ph.D. (Cantab.). Soil Science.

G. R. Clarke, M.A., B.Sc. (Oxon.). Soil Science.

A. R. Robbins, M.A. (Oxon.). Surveying.

M. R. Sampford, B.Sc. (Lond.). Statistical Methods.

III. OTHER STAFF

Secretary: Miss H. M. Edwards.

Assistant Secretary: Miss I. Blagrove.

Accountant: Mr. A. A. Adams.

Librarian: Miss G. Guiney.

Assistant Librarians: Mr. Y. Smythies, M.A. (Cantab.).
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